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Science and Technology for Tomorrow's Aerospace Forces

Success Story

LASER ULTRASONIC TECHNOLOGY IMPROVES COMPOSITE PARTS INSPECTIONS FOR EXISTING FIGHTER AIRCRAFT



The Laser Ultrasonic Technology (LaserUT™) system requires minimal set-up time and performs high-resolution, composite parts inspections in a fraction of the time required by conventional water ultrasonic inspection systems. Steep reductions in inspection times will shorten manufacturing span times by several weeks, resulting in major cost savings for the Department of Defense. The LaserUT inspection system's improved accuracy enables even higher standards of quality for the Air Force and commercial aerospace sector.



Air Force Research Laboratory
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Materials and Manufacturing
Emerging Technologies

Accomplishment

A new aircraft composite parts inspection system, developed with support from the Materials and Manufacturing Directorate, will reduce the time required to inspect composite parts by up to 90%. The LaserUT system, developed by Lockheed Martin Aeronautics Company with technical assistance from the directorate's Nondestructive Evaluation Branch, enables affordable, highly accurate, high-volume inspection of complex-contoured composite parts for existing fighter aircraft. Long-term benefits for the Air Force include improved parts quality, shorter production times, and several hundred million dollars in savings over the lifetime of major aircraft acquisition programs.

Background

Existing fighter aircraft will have a high percentage of graphite-epoxy composite materials in their structures because these materials offer a high strength-to-weight ratio and extended service life. Extensive inspection is required, however, to ensure no flaws exist in the many layers that make up the finished components.

The Lockheed Martin Aeronautics Company, with technical assistance from directorate scientists and engineers, began inspecting composite aircraft parts using the patented LaserUT inspection system. This effort marked the first time Lockheed Martin engineers inspected aircraft composite parts using the advanced laser testing system, following years of research and prototyping by Lockheed Martin Aeronautics and its predecessors.

The LaserUT effectively handles complex-contoured components up to 54 ft long, 27 ft wide and 21 ft high. A supercomputer, capable of advanced, real-time signal processing and data analysis, controls the equipment and also has a user-friendly operator interface that provides state-of-the-art ultrasonic flaw detection. The system provides real-time feedback to the system operator, or design and process engineers, facilitating rapid configuration and process changes.

The Lockheed Martin Aeronautics Company is continuing its research and development of the LaserUT inspection system in an effort to further reduce inspection times and meet affordability requirements. Directorate engineers expect the LaserUT to save several hundred million dollars over the operational lives of existing fighter aircraft programs due to greatly increased parts throughput. For example, using conventional parts inspection equipment, it takes about 24 hours to fully inspect a composite inlet duct on an advanced fighter aircraft. Using LaserUT technology, directorate engineers reduced the time to less than two hours, representing a 90% reduction in test-cycle times.

Additional information

To receive more information about this or other activities in the Air Force Research Laboratory, contact TECH CONNECT, AFRL/XPTC, (800) 203-6451 and you will be directed to the appropriate laboratory expert. (02-ML-04)